TABLE 5

Bresnahan's Survey of Prior Empirical Estimates of Lerner Indices

Author	Industry	λ
Lopez (1984)	Food Processing	0.504
Roberts (1984)	Coffee roasting	0.055/0.025[a]
Appelbaum (1982)	Rubber	0.049
Appelbaum (1982)	Textile	0.072[c]
Appelbaum (1982)	Electrical machinery	0.198[c]
Appelbaum (1982)	Tabacco	0.648[c]
Porter (1983)	Railroads	0.40[b]
Slade (1987)	Retail gasoline	0.10
Bresnaham (1981)	Automobiles (1970s)	0.1/0.34[d]
Suslow (1986)	Aluminum (interwar)	0.59
Spiller-Favaro (1984)	Banks "before"[e]	0.88/0.21[f]
Spiller-Favaro (1984)	Banks "after"[e]	0.40/0.16[f]

[a] Largest and second largest firm, respectively.
[b] When cartel was succeeding: 0 in reversionary periods.
[c] At sample midpoint.
[d] Varies by type of car; larger in standard, luxury segment.
[e] Uruguayan banks before and after entry deregulation.
[f] Large firms/small firms (see their table 2).

used by regulators for classification purposes.

VI. A Test for Tacit Collusion

An issue that is closely related to the ongoing concern about the degree of unilateral market power held by AT&T is whether the long distance industry has recently evolved into a tacitly collusive oligopoly characterized by price leadership and stable market shares among the three largest firms. Proponents of this argument point to two recent developments to support the inference of tacit collusion.[31] First, beginning in 1989, at the same time the FCC altered the way in which it regulates AT&T from traditional rate-of-return controls to price caps, AT&T's market share began to stabilize on a minutes-of-use basis. And second, in 1993, AT&T announced its first price increase since divestiture, and MCI and Sprint appeared to follow those increases. While neither of those events, either alone or in combination, is theoretically sufficient to support a claim of tacit collusion, both are conceivably consistent with a general decline in the intensity of competition in this industry.[32]

A complete assessment of this issue is beyond the scope of this paper. Nonetheless, given the econometric model presented above, it is possible to develop a simple empirical test of the tacit collusion argument. Such a test focuses on the slope of the fringe supply curve in

---

[31]See, e.g., "Affidavit of Paul W. McAvoy" in the District Court for the District of Columbia, United States of America v. Western Electric Company, Inc., and American Telephone and Telegraph Company, June 22, 1994.

[32] At the same time, they are also both consistent with other explanations based upon competitive market performance.

the DF/CF model. Specifically, in an industry where tacit collusion occurs, a price increase by the dominant firm (which requires a reduction in that firm's output) will be met by a corresponding reduction in the output of fringe producers. This sort of accommodating supply response under tacit collusion is noted by Posner (1976, p.72):

> [in tacit collusion,] "one seller communicates his 'offer' by reducing output, and the offer is 'accepted' by the actions of his rivals in restricting output as well."

Conversely, in the absence of tacit collusion, a reduction in the dominant firm's output (or an increase in the dominant firm's price) will be met by an increase in the output of the fringe. Therefore, the appearance of tacit collusion can be detected in our model by a shift in the competitive fringe supply curve.

Accordingly, we modified the empirical specification of the inverse fringe supply equation to allow for the possibility of a shift in the responsiveness (i.e., elasticity) of the fringe firms' supply beginning in 1989. Given our linear specification of this supply equation, such a shift will appear as a change in either the slope or intercept of the $P_F(\bullet)$ function in equation (3). Writing this equation in linear form, we have

$$P = \beta_0 + \beta_1 Q_F + \beta_2 PA + \beta_3 EA \ . \qquad (5)$$

Then, defining C to be a binary variable that becomes one in the third quarter of 1989 and is zero prior to that time, we can allow both the intercept and slope of the fringe supply curve to shift by specifying

$$\beta_0 = \delta_0 + \delta_1 C \tag{6}$$

and

$$\beta_1 = \alpha_0 + \alpha_1 C \,. \tag{7}$$

Substituting equations (6) and (7) into equation (5), we have

$$P = \delta_0 + \delta_1 C + \alpha_0 Q_F + \alpha_1 C \cdot QF + \beta_2 PA + \beta_3 EA \tag{8}$$

If tacit collusion emerged in this industry in 1989, then the shift parameters δ_1 and/or α_1 should be statistically significant.

Table 6 reports the results obtained from estimating equation (8) with 2SLS.[33] Both of the estimated shift parameters are insignificant. Moreover, none of our prior results are materially altered by the inclusion of these variables. Therefore, the empirical evidence fails to support the claim that tacit collusion has emerged in the long distance telecommunications industry. We can detect no significant change in the supply response of the competitive fringe firms in this market since the introduction of price cap regulation that would indicate any lessening of the intensity of competition faced by AT&T.

VIII. Conclusion

At divestiture, considerable debate emerged concerning the long-run viability of competition in the long distance telecommunications industry. In the decade since divestiture,

---

[33] Both Q_F and $C \cdot Q_F$ are treated as right-hand endogenous variables in this estimation. The model was also estimated with three-stage least squares (3SLS). Because the 3SLS results are virtually identical to the 2SLS results, we report only the latter.

TABLE 6

Tacit Collusion Test
Inverse Fringe Supply Equation
2SLS Estimates

Variables	Coefficient	t-Statistic
Intercept	0.063	1.808**
C	0.014	0.754
$C \cdot Q_F$	-0.001	-1.287
Q_F	0.003	3.172*
P_A	1.808	9.738*
EA	-0.001	-6.003*

R^2 = 0.99
F = 1254.302
*Significant at the .01 level.
**Significant at the .10 level.

that debate has continued unabated and has recently been invigorated by the BOCs' appeals to be allowed to reenter the interLATA long distance market and their claims regarding the intensity of competition in that market. To date, however, the arguments presented have proceeded primarily on a priori theoretical grounds pertaining to conditions of natural monopoly and largely ad hoc analyses of the emerging structural characteristics of the industry. While evidence of this nature is valuable in attempting to resolve this important public policy issue, it is important to attempt to corroborate such information with empirical studies as the requisite data become available.

In this spirit, we have employed the DF/CF model to estimate both fringe supply and market demand elasticities in the interstate long distance telecommunications market. We have employed the resulting elasticity estimates along with prior information on AT&T's market share to calculate empirical estimates of AT&T's market power. Our estimates indicate that AT&T's residual demand elasticity is between -3.48 and -7.81, resulting in Lerner index values between 0.29 and 0.13, respectively. Comparison of these values with prior Lerner index estimates for firms in other industries suggests that, relative to these other (unregulated) industries, the long distance market is highly competitive.

Additionally, we were able to modify the model to examine the recent allegations that the competitive performance in the long-distance marketplace has been compromised by the emergence of a tacitly collusive pattern of price leadership. Specifically, within the context of the model examined, support for such a claim may arise from a dimunition in the elasticity of supply of competitors to AT&T. An empirical test of the data reveal no such change in the propensity of competitors' responsiveness to price and profit opportunities in the

marketplace. Thus, our examination of the data finds no support for the proposition that the market is becoming subject to tacit collusion or less rivalrous. The elasticity of competitors' supply remains very high, indicating both a willingness and ability to expand. It is precisely this willingness and ability to expand by competitors that limit the ability of AT&T (or for that matter any firm in this market) to engage in supra-competitive pricing. To the extent that the "dominant firm" label and the affiliated policy of asymmetric regulation were originally proposed as a mechanism to handle residual, but significant, monopoly power on the part of AT&T, our findings clearly indicate that this is a label and policy that are no longer warranted.

Finally, we close with two observations. First, our results are particularly striking in light of our use of AT&T's tariffed rates for residential long distance service in the regression analysis. Indeed, because long distance companies now routinely offer promotions and discounted optional calling plans, our results may significantly understate the benefits that consumers have received from the extant competition in the long distance marketplace. Moreover, the fact that we achieved these results using tariffed prices that are available to all customers of long distance service provides compelling evidence that all residential long distance consumers, not just large business customers, are benefitting from competition.

Second, while we have chosen to emphasize the implications of our analysis for the issue of federal regulatory policy, the results also have important implications for the merits of current legislative and judicial proposals to lift the MFJ line-of-business restrictions currently imposed on the Regional Bell Operating Companies. Specifically, the merits of a legislatively or judicially-imposed lifting of those restraints should fundamentally turn on an

assessment of the benefits and costs of those restraints. While a complete assessment of those benefits and costs is beyond the scope of this paper, the clear evidence to emerge in this paper that the long distance market is effectively competitive suggests that the benefits, if any, from additional entry into the interexchange business are likely to be very limited. At the same time, the risks of monopoly leveraging (that have been documented elsewhere)[34] impose costs of removing the current MFJ line-of-business restrictions. Accordingly, our results suggest that the restrictions be maintained until such time as the monopoly power which provides the fulcrum for monopoly leveraging is eliminated.

[34]See Kaserman and Mayo (1993).

REFERENCES

Areeda, Phillip and Louis Kaplow, Antitrust Analysis: Problems, Text, Cases, Fourth Edition (Boston, MA.: Little, Brown and Company), 1988.

Baker, Jonathan B. and Timothy F. Bresnahan, "Empirical Methods of Identifying and Measuring Market Power," Antitrust Law Journal, Vol. 61 (1992), pp. 3-16.

Baker, Jonathan B. and Timothy F. Bresnahan, "Estimating the Residual Demand Curve Facing a Single Firm," International Journal of Industrial Organization, Vol. 6 (1988), pp. 283-300.

Bjorndal, T., D. V. Gordan, and B. Singh, "A Dominant Firm Model of Price Determination in the US Fresh Salmon Market: 1985-88," Applied Economics, Vol. 25 (1993), pp. 743-775.

Bresnahan, Timothy F. "Empirical Studies of Industries with Market Power," Chapter 17 in Handbook of Industrial Organization, Vol II, R. Schmalensee and R.D. Willig, editors, Amsterdam: North-Holland Publishers, 1989.

Federal Communications Commission "Long Distance Market Share," Industry Analysis Division, Common Carrier Bureau, 1992/93.

Faulhaber, Gerald R. Telecommunications in Turmoil (Cambridge: Ballinger Publishing Company), 1987.

Gatto, J.P., Langin-Hooper, J., Robinson, P.B., and Tryan, H. "Interstate Switched Access Demand," Information Economics and Policy, Volume 3, (1988), pp. 333-358.

Hall, Robert E. "The Relation between Price and Marginal Cost in U.S. Industry," Journal of Political Economy, Vol. 96 (1988), pp. 921-947.

Hall, Robert E. "Long Distance: Public Benefits from Increased Competition," mimeo, Applied Economics Partners, Menlo Park, CA, 1993.

Haring, John and Kathleen Levitz, "What Makes the Dominant Firm Dominant?" Working Paper, Office of Plans and Policy, Federal Communications Commission, 1989.

Hausman, Jerry, Timothy Tardiff, and Alexander Belinfante, "The Effects of the Breakup of AT&T on Telephone Penetration in the United States," American Economic Review, Vol. 83 (May 1983), pp. 178-184.

Hovenkamp, H. "Antitrust Analysis of Market Power with Some Thoughts about Regulated Industries," in Telecommunications Deregulation: Market Power and Cost Allocation Issues, J. R. Allison and D. L. Thomas, editors, Cambridge, MA: Ballinger Publishing Company, 1987.

Kaestner, R. and B. Kahn, "The Effects of Regulation and Competition on the Price of AT&T Intrastate Telephone Service," Journal of Regulatory Economics, Vol. 2 (1990), pp. 1-15.

Kaserman, David L. and John W. Mayo, Leveraging Theory: Implications for Post-Divestiture Telecommunications Policy, Center for Business and Economic Research, University of Tennessee, March 1993.

Kaserman, David L. and John W. Mayo, "Long Distance Telecommunications Policy: Rationality on Hold," Public Utilities Fortnightly, Vol. 122 (December 22, 1988), pp. 18-27.

Kaserman, David L. and John W. Mayo, "Long-Distance Telecommunications: Expectations and Realizations in the Post-Divestiture Period," in Incentive Regulation for Public Utilities, Michael A. Crew, editor, Boston, MA: Kluwer Academic Publishers, 1994.

Kaserman, David L. and John W. Mayo, Government and Business: The Economics of Antitrust and Regulation (Ft. Worth, TX.: Dryden Press), 1995.

Katz, M. L. and R. D. Willig, "The Case for Freeing AT&T," Regulation (July-August, 1984), pp. 43-49.

Landes, William M. and Richard A. Posner, "Market Power in Antitrust Cases," Harvard Law Review, Vol. 94 (1981), pp. 937-996.

Mathios, A. D. and R. P. Rogers, "The Impact of Alternative Forms of State Regulation of AT&T on Direct-Dial, Long-Distance Telephone Rates," RAND Journal of Economics, Vol. 20 (1989), pp. 437-453.

Porter, Michael E. "Competition in the Long Distance Telecommunications Market," Monitor Company, September 1993.

Posner, Richard A. Antitrust Law: An Economic Perspective, Chicago: University of Chicago Press, 1976.

Saving, Thomas R. "Concentration Ratios and the Degree of Monopoly," International Economic Review, Vol. 11 (1970), pp. 129-146.

Scheffman, David T. and Pablo T. Spiller, "Geographic Market Definition Under the U.S. Department of Justice Merger Guidelines," Journal of Law and Economics, Vol. 30 (1987), pp. 123-147.

Shepherd, William G. "Long-Distance Telephone Service: Dominance in Decline?" in Industry Studies, Larry L. Duetsch, ed., Englewood Cliffs, NJ: Prentice Hall, 1993, pp. 342-363.

Stigler, George J. "The Dominant Firm and the Inverted Umbrella," Journal of Law and Economics, Vol. 8 (October 1965), pp. 167-172.

Taylor, Lester D. "Pricing of Telecommunications Services: Comment or Gabel and Kennet," Review of Industrial Organization, Vol. 8 (1993), pp. 15-19.

Taylor, Lester D. Telecommunications Demand in Theory and Practice, Boston, MA: Kluwer Academic Publishers, 1994.

Taylor, William E. and Lester D. Taylor, "Postdivestiture Long-Distance Competition in the United States," American Economic Review, Vol. 83 (May 1993), pp. 185-190.

Temin, Peter The Fall of the Bell System (New York: Cambridge University Press) 1987.

Ward, Michael R. "Market Power in Long Distance Telecommunications," mimeo, 1993.